



Course Title:	<i>Nickel-based Superalloys</i>
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CONTACT INFORMATION	
Course Leader	<i>Roger Reed/Cathie Rae</i>
COURSE DETAILS	
Module Code (if known)	<i>RRDTC1</i>
Level	<i>Masters</i>
Pre-requisites	<i>None</i>
Linked courses	<i>None</i>
Credits	<i>10 (for Swansea and Birmingham)</i>
Total student effort	<i>2 weeks approx</i>
Delivery	<i>Preliminary reading, interactive lectures and classes</i>
Assessment method(s)	<i>Written exercises during and after delivery</i>
Resources needed	<i>Thermocalc software</i>
Texts	<i>The superalloys by Roger Reed + Resource Pack</i>

Course Description: ~150 Words

Briefly describe areas covered indicating depth of coverage

This course aims to give a broad knowledge of the physical metallurgy of Nickel-based superalloys, their uses virtues and limitations. Emphasis will be put on understanding the general principles of the alloying strategies used in the various families of alloys and rationalising the physics and chemistry of the resulting compositions to the properties obtained. Teaching will be by interactive lectures and supervised exercises in the afternoons including the use of Thermocalc to investigate phase equilibria. This will include an exercise to design a superalloy.

- Requirements of the high-temperature alloys for gas turbine applications
- Physical Metallurgy of Nickel encompassing the electronic structure and bonding and the phase diagrams with important alloying elements
- Basis of the strengthening mechanisms in superalloys
- Single crystal alloys for blade applications
- Superalloys for Disc applications including powder technology and dual microstructure
- Environmental degradation and the role of coatings

Learning Outcomes: Max 50 words

On completion the student should be able to:

- Understand the requirements of the materials used in gas-turbines
- Be familiar with the main classes of superalloys and the coatings used to protect them
- Investigate the equilibrium phase chemistry of superalloys using thermocalc
- Rationalise the physical properties of superalloys with the phase chemistry and microstructure.